Citation:

Field AE, Austin SB, Gillman MW, Rosner B, Rockett HR, Colditz GA. Snack food intake does not predict weight change among children and adolescents. Internatl J Obes Relat Metab Disord. 2004; 28: 1210-1216.

PubMed ID: 15314623

Study Design:

prospective cohort study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To assess whether intake of snack foods, including reduced fat snack foods, are predictive of weight gain in preadolescents and adolescents.

Inclusion Criteria:

Study subjects included 9 to 14 year old children of women participating in the Nurses' Health Study II(NHS II) in 1996 who returned a completed questionnaire assenting to participate in the cohort.

must have completed at least 2 dietary questionnaires between 1996 and 1999

plausible information provided on height and weight

Exclusion Criteria:

Those children who failed to return completed questionnaires.

Description of Study Protocol:

Recruitment Detailed written letters were sent in 1996 to mothers participating in the Nurses' Health Study II (NHS) explaining the purpose of the Growing Up Today Study (GUTS), and sought parental consent to enroll their children.

Design Prospective Cohort design

Blinding used (if applicable) NA

Intervention (if applicable) NA

Statistical Analysis

- Mixed linear regression models assessed the association between intake of snack foods and weight change over approximately 1 year intervals, with control variables included in differen models.
- All P-values are two-sided, with $P<0.05$ considered significantly significant.

Data Collection Summary:

Timing of Measurements approximately one year apart for three years (1996-1999)

Dependent Variables

- change in weight: age and gender specific z-score of BMI (based on CDC reference data)

Independent Variables

- snack food intake measured via annual questionnaire (Youth/Adolescent Questionnaire (YAQ), a validated semi-quantitative food frequency questionnaire

Control Variables

- age, age squared
- Tanner Stage of development
- activity and inactivity: number of hours in activity, watching TV, watching videos, reading/ homework, playing video games
- age and gender specific z-score at beginning of 1-yr interval
- height change over the one year interval
- dieting status
- mother's weight statue
- race and ethnicity
- caloric intake

Description of Actual Data Sample:

Initial N: 16,882 preadolescents and adolescents consented to participate in the study

Attrition (final N): 14,977 participants completed at least two GUTS questionnaires and provided plausible information on height and weight on the questionnaires. N=8203 females, 6774 males

Age: females: 12.0 ± 1.6; males: 11.9 ± 1.5 years

Ethnicity: not specified

Other relevant demographics: Subjects were children of nurses participating in the Nurse's Health Study II (NHS II), therefore, there were likely very few children of low socioeconomic status.

Anthropometrics

- BMI: females: 19.0 ± 3.3 kg/m^2; males: $19. \pm 1.3.3$ kg/m^2

- z score of BMI: females: 0.1±1.0; males: 0.2±1.1
- BMI ≥ 25 kg/m^2: females: 38.9%; males: 38.6%

Location: United States

Summary of Results:

Key Findings:

- Among girls, (after controlling for Tanner stage of developments, age,height change, activity, and inactivity) snack food intake was a significant, but weak, inverse predictor of annual changes in BMI z-score (β = -0.007 per serving, P<0.05)
- Boys consumed more snack foods than girls during the entire study period but there was no association between snack food intake and BMI changes among boys (β = 0.004).
- Dieting status and mother's weight status were significant independent predictors of change in BMI z-score but after adjusting for them in the statistical model, servings per day of snack food was no longer a significant predictor in either gender.
- When servings per day of sugar-sweetened beverages were included as snack foods, the association between snack food intake and change in BMI z-score was similar to the main findings (β= -0.004 versus -0.006 for the girls and β= -0.003 versus -0.004 for the boys)
- Compared to girls who consumed less than one serving per day of snack foods or beverages, girls consuming 3 to 5 servings or fiver or more servings a day did not make significantly larger changes in BMI z-score.
- Annual changes in snack food intake were unrelated to changes in BMI z-scores among both females and males.
- Among the boys, but not the girls, consumption of reduced fat snack foods was associated with less weight gain.

Mean (s.d.) of age, body mass index (BMI), and daily intake of snack foods in 1996 among preadolescents and adolescents in the Growing up Today Study

	Girls (n=8203)	Boys (n=6774)
Age (y)	12.0 (1.6)	11.9 (1.5)
BMI (kg/m^2)	19.0 (3.3)	19.1 (3.3)
z-score of BMI	0.1 (1.0)	0.2 (1.1)
Servings/day of snack food	3.0 (1.6)	3.2(1.7)
Intake of low or no fat snack foods[a]		
Never	26.9%	40.7 %
Rarely	12.7%	13.7%
Sometimes	55.2%	43.1%
Always	5.2%	2.5%

Prevalence of maternal overweight (BMI≥ 25)[b]	38.9%	38.6%

[a]Assessed in 1997. [b]Assessed in 1995 as part of the Nurse's Health Study II.

Prospective association between intake of snack foods and annual change in BMI z-score between 1996 and 1999 (Growing Up Today Study)

	Model 1: partially adjusted[a] (β)	Model 1 +mother's weight (β)	Model 1 +mother's weight and interaction with snack foods (β)	Model 1 +mother's weight and dieting (β)	Model 1 +mother's weight, dieting, and total calories (β) (95% CI)
(a) Among preadolescent and adolescent girls					
Snack food intake	-0.007*	-0.006*	-0.005	-0.005	-0.006 (-0.013, 0.001)
Mother is overweight		0.047§	0.051§	0.047§	0.047 (0.032,0.061)
Interaction between snack food intake and mother being overweight			-0.002		
Dieting to control weight					
infrequent dieting				0.026¶	0.026 (0.010,0.042
frequent dieting				0.047¶	0.061 (0.030, 0.093)
(b) Among preadolescent and adolescent boys					
Snack food intake	-0.003	-0.004	0.008	-0.002	-0.004 (-0.014, 0.007)
Mother is overweight		0.059§	0.026	0.059§	0.059 (0.036, 0.082)
Interaction between snack food intake and mother being overweight			0.012		
Dieting to control weight					
infrequent dieting				0.012§	0.112 (0.063, 0.162)
frequent dieting				0.117*	0.117 (0.021, 0.214)

[a]From mixed linear regression models controlling for age, age squared, Tanner stage, height change, baseline weight (modeled as age- and gender specific z score of BMI), activity and inactivity. *P<0.05. ¶P<0.01. §P0.001.

Author Conclusion:

The authors concluded that snack foods were not an important independent determinant of weight gain among preadolescent children and adolescents.

Reviewer Comments:

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	No

2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	N/A
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	No
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	No

5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	No
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	No
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes

	8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
	8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
	8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
	8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
	8.6.	Was clinical significance as well as statistical significance reported?	Yes
	8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**		Yes
	9.1.	Is there a discussion of findings?	Yes
	9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**		Yes
	10.1.	Were sources of funding and investigators' affiliations described?	Yes
	10.2.	Was the study free from apparent conflict of interest?	Yes